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Medicine Bow – Routt National Forests & Thunder Basin National Grassland

Laramie, Wyoming

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Wildfire and Fuels Report

Medicine Bow LaVA Project

Medicine Bow National Forest

Albany and Carbon Counties, Wyoming

_/s/ Daron Reynolds, Jerod Delay_____ ***__May 2018__***

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Introduction

Ownership/Location

The Medicine Bow National Forest Landscape Vegetation Analysis Area (AA) encompasses the Medicine Bow and Sierra Madre mountain ranges on the Medicine Bow-Routt National Forests and Thunder Basin National Grassland. It is located entirely on the Medicine Bow National Forest. The analysis area is located in Albany and Carbon Counties, Wyoming.

The analysis is broken down into Treatment Opportunity Areas and furthermore into Accounting Units.

Treatment Opportunity Areas are areas wherein treatment activities could be proposed during the Landscape Vegetation Analysis (LVA) project implementation; they were established by applying coarse filters, such as applicable laws, regulations, policies, Forest Plan direction and leaders intent. While they do not take into account resource limitations (i.e., mid-filters are being developed to refine TOAs), they were developed to narrow the scope of the analysis by identifying known, legal constraints.

The LVA includes two types of TOAs: Mechanical and/or Prescribed Fire and Prescribed Fire and/or Hand Tool.

Mechanical and/or Prescribed Fire TOAs (564,793 acres): Authorized activities may include timber harvest, prescribed fire, hand tools and mastication. Mechanical TOAs exclude NFS lands inside the following Forest Plan Management Areas (MAs): Wilderness, Semi-primitive (MA 1.13); Recommended for Wilderness (MA 1.2); Special Interest Areas (MA 2.1); Research Natural Areas (MA 2.2); and mapped and inventoried old growth in MA 5.15 – Ecological Restoration. They also exclude portions of Inventoried Roadless Areas (IRAs) where treatment justifications were not provided by cooperation agencies and Forest Service staff. All other NFS administered lands are considered Mechanical TOAs.

Prescribed Fire and/or Hand Tool TOAs (50,657): Authorized activities may include prescribed fire and hand tools only. These areas exclude NFS lands inside the following Forest Plan Mas: MA 1.13 (Wilderness, Semi-Primitive) and areas identified as mapped and inventoried old growth in MA 5.15 – Ecological Restoration. They also exclude portions of Inventoried Roadless Areas (IRAs) where treatment justifications were not provided by cooperation agencies and Forest Service staff. All other NFS administered lands are considered Prescribed Fire/Hand Tool TOAs.

The LVA area includes 844,343 acres of National Forest System administered lands. As acknowledged above, 564,793, acres have been identified as Mechanical and/or Prescribed Fire TOAs and 50,657 acres have been identified as Prescribed Fire and/or Hand Tool TOAs. Collectively, these two TOAs comprise 615,451 acres which equates to approximately 73% of the analysis area being available for treatment activities during the LVA project implementation. Areas identified with no treatment total 228,892 acres or 27% of the analysis area.

As stated above, both the Mechanical and the Prescribed Fire and/or Hand Tool TOAs provide the legal framework for where treatment activities may be proposed within the LVA area boundary.

The summary, written by the specialists after the body of the report, contains essentially the same information as the Executive Summary.

The Forest Service does not have jurisdiction for non-federal in-holdings. Protection of private land and private residences are the responsibility of the Albany County Fire District and the Carbon County Fire District. The properties within the AA have been identified in the **Albany/Carbon County Wildfire Hazard and Risk Assessment Plans**.

This plan identifies these areas as wildland urban interface. The LRMP states that management activities will generally occur less than one half mile from the identified communities and will be subordinate to more restrictive management areas (LRMP 2003). The Albany/Carbon County Wildfire Hazard and Risk Assessment Plans explains; what mitigation steps can be done on private land, what home owners should do to protect both their land and residences from wildfire, what home owners should do to prevent a wildfire that starts on private land from transitioning onto public (National Forest administered lands) and recommends that fuels be treated within a two mile buffer around the identified communities. Collaboration between government agencies and property owners is essential.

The project area encompasses approximately 615,230 acres of National Forest System (NFS) lands and 150,000 – 350,000 vegetation treatment acres located in Albany and Carbon counties in South Central Wyoming. Proposed activities would occur on NFS lands managed by the Medicine Bow National Forest, Laramie and Brush Creek/Hayden Ranger Districts, within the areas designated by the Secretary of Agriculture under the amended Healthy Forests Restoration Act. For purposes of analyzing the Proposed Action, the project area is divided into 14 Accounting Units.

Table 1. List of Accounting Unit acreages and No Treatment acres found in them.

Accounting Unit Name	Total Accounting Unit Acres	Acres of Accounting Unit In Treatment Opportunity Areas	No Treatment Acres
Battle Pass	49436	27206	22230
Big Blackhall	73223	48291	24932
Bow Kettle	64656	42122	22534
Cedar Brush	60735	44169	16566
Foxwood	85605	76934	8672
French Douglas	66091	40793	25298
Green Hog	65940	34412	31528
Jack Savery	79139	69763	9376
North Corner	45116	29799	15307

Owen Sheep	28747	22527	6220
Pelton Platte	49294	19574	29720
Rock Morgan	62313	35801	26512
Sandy Battle	94484	72158	22326
West French	69694	51681	18013

Final treatment units and acres will be determined following stand diagnosis and after collaboration between Forest Service resource specialists and the public has occurred. Treatment units are located primarily within MAs 8.21, 7.1, 5.15, 4.3, 4.2, 3.58, 3.54, 2.1, and 1.33. The unmapped 7.1 Residential/Forest Interface management emphasis applies to lands adjacent to communities, infrastructure, access/egress roads and water sheds with high values at risk identified in the Albany and Carbon county CWPP's.

The best **ESTIMATE** of this fuel model per Accounting Unit and Treatment Opportunity Area is as follows:

Accounting Units/TOA type	Total Accounting Unit/TOA Acres	FM TU5	FM TL3	FM TU1	FM GS1 and GS2	FM GR1 and GR2	Sub Totals
Sandy Battle/Potential Mechanical or Prescribed Fire Treatment Opportunity	64687	4471	7091	13347	15881	636	
Sandy Battle/Prescribed Fire and Hand Treatment	6713	427	830	1856	2156	260	
	94484	4898	7921	15203	18037	896	46955
Jack Savery/Potential Mechanical or Prescribed Fire Treatment Opportunity	63046	10184	15961	5535	7977	1393	
Jack Savery/Prescribed Fire and Hand Treatment	6468	1432	2751	739	943	436	
	79139	11616	18712	6274	8920	1829	47351
Battle Pass/Potential Mechanical or Prescribed Fire Treatment Opportunity	21290	6664	6824	4225	2163	636	
Battle Pass/Prescribed Fire and Hand Treatment	5527	1357	1145	852	518	260	
	49436	8021	7969	5077	2681	896	24644
Green Hog/Potential Mechanical or Prescribed Fire Treatment Opportunity	29885	3696	4046	3632	3607	963	
Green Hog/Prescribed Fire and Hand Treatment	4333	340	495	394	422	240	
	65940	4036	4541	4026	4029	1203	17835
Big Blackhall/Potential Mechanical or Prescribed Fire Treatment Opportunity	47490	2063	7322	1948	7877	1070	
Big Blackhall/Prescribed Fire and Hand Treatment	589	226	152	66	98	26	
	73223	2289	7474	2014	7975	1096	20848
Bow Kettle/Potential Mechanical or Prescribed Fire Treatment Opportunity	36865	3429	6341	2308	2826	464	
Bow Kettle/Prescribed Fire and Hand Treatment	5080	729	527	343	267	15	
	64656	4158	6868	2651	3093	479	17249
Rock Morgan/Potential Mechanical or Prescribed Fire Treatment Opportunity	28092	3713	6052	1976	1987	839	
Rock Morgan/Prescribed Fire and Hand Treatment	7780	2771	1830	1229	554	182	
	62313	6484	7882	3205	2541	1021	21133
Cedar Brush/Potential Mechanical or Prescribed Fire Treatment Opportunity	37959	3768	5998	1901	4021	1425	
Cedar Brush/Prescribed Fire and Hand Treatment	1133	332	226	264	85	74	
	60735	4100	6224	2165	4106	1499	18094
West French/Potential Mechanical or Prescribed Fire Treatment Opportunity	50877	1744	8752	2165	5269	1460	
West French/Prescribed Fire and Hand Treatment	677	116	148	110	76	113	
	69694	1860	8900	2275	5345	1573	19953
North Corner/Potential Mechanical or Prescribed Fire Treatment Opportunity	21876	3274	4022	1698	1655	1129	
North Corner/Prescribed Fire and Hand Treatment	7900	3505	1726	1075	791	438	
	45116	6779	5748	2773	2446	1567	19313
French Douglas/Potential Mechanical or Prescribed Fire Treatment Opportunity	38389	2132	8388	2233	2315	786	
French Douglas/Prescribed Fire and Hand Treatment	2203	509	1056	260	215	60	
	66091	2641	9444	2493	2530	846	17954
Pelton Platte/Potential Mechanical or Prescribed Fire Treatment Opportunity	17495	186	628	620	3498	864	
Pelton Platte/Prescribed Fire and Hand Treatment	2076	7	43	31	432	107	
	49294	193	671	651	3930	971	6416
Fox Wood/Potential Mechanical or Prescribed Fire Treatment Opportunity	76675	2404	18491	1934	11699	2296	
Fox Wood/Prescribed Fire and Hand Treatment	160	1	73	2	25	4	
	85605	2405	18564	1936	11724	2300	36929
Owen Sheep/Potential Mechanical or Prescribed Fire Treatment Opportunity	22535	409	3162	643	9098	1075	
Owen Sheep/Prescribed Fire and Hand Treatment	0					0	
	28747	409	3162	643	9098	1075	14387
Grand Totals	**894473**						**329061**

Relationship to Land Management Planning

All lands administered by the USFS that are located within the AA are covered under the Medicine Bow National Forest Revised Land and Resource Management Plan 2003. Currently, all wildland fires receive Appropriate Management Response (AMR). AMR refers to the full spectrum of fire management options that are available from full direct suppression to perimeter and prescription control that allows natural fires to occur on the landscape to achieve resource benefits. Direct control is associated with urban development and high value areas and is defined as the immediate and complete extinguishments of a wildfire. Direct control also includes exposure protection in which high value resources, such as houses, are protected from the fire. Perimeter Control is a strategy that seeks to confine the active zone responsible for fire spread. In the perimeter control, the appropriate management response considers site-specific values at risk. Firelines, whether natural or constructed, are used to confine the active zone of spreading fire. Direct or indirect fireline locations are selected to minimize the combined cost of suppression, exposure to suppression resources and the values that could be lost in the fire. Prescription control emphasizes wildland fire for resource benefits. This strategy uses unplanned ignitions within specific geographic areas, allowing fire to play its ecological role. Under prescription control, fire is considered to be controlled as long as it burns within specified geographic boundaries and predetermined burning indices. Parameters for this strategy are contained within a written prescription documented in the Wildfire Decision Support System. Fires that are within prescription and advancing management goals toward desired condition are monitored. Where a fire jeopardizes investments or other critical resource values, a suppression response is expected. The full suite of responses are expected to be utilized within the identified Landscape Vegetation Analysis units.

From a fuels management stand point the forest plan identifies one standard for the Residential/Forest Interface (direct control response) areas that is to allow direct attack, treat management activity fuels to reduce fire intensity levels within 3 years after vegetation management activities are completed.

Federal Laws and Regulations

The Healthy Forests Restoration Act (HFRA) of 2003 will be used as the authorizing this project, therefore the definitions within HFRA will used to define the Wildland Urban Interface (WUI). HFRA defines WUI as:

WILDLAND-URBAN INTERFACE- The term ‘wildland-urban interface’ means--

From a fuels management stand point the forest plan identifies one standard for the Residential/Forest Interface areas that is to allow direct attack, treat management activity fuels to reduce fire intensity levels within 3 years after vegetation management activities are completed.

(A) an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan; or

(B) in the case of any area for which a community wildfire protection plan is not in effect--

(i) an area extending 1/2 -mile from the boundary of an at-risk community;

(ii) an area within 1 1/2 miles of the boundary of an at-risk community, including any land that--

(I) has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community;

(II) has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or

(III) is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; and

(iii) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to provide safer evacuation from the at-risk community. Sec. 101 (16)

Under Sec. 102 HFRA authorizes hazardous fuels reduction projects that fall within:

AUTHORIZED PROJECTS- As soon as practicable after the date of enactment of this Act, the Secretary shall implement authorized hazardous fuel reduction projects, consistent with the Implementation Plan, on--

(1) Federal land in wildland-urban interface areas;

(2) condition class 3 Federal land, in such proximity to a municipal water supply system or a stream feeding such a system within a municipal watershed that a significant risk exists that a fire disturbance event would have adverse effects on the water quality of the municipal water supply or the maintenance of the system, including a risk to water quality posed by erosion following such a fire disturbance event;

(3) condition class 2 Federal land located within fire regime I, fire regime II, or fire regime III, in such proximity to a municipal water supply system or a stream feeding such a system within a municipal watershed that a significant risk exists that a fire disturbance event would have adverse effects on the water quality of the municipal water supply or the maintenance of the system, including a risk to water quality posed by erosion following such a fire disturbance event;

(4) Federal land on which windthrow or blowdown, ice storm damage, the existence of an epidemic of disease or insects, or the presence of such an epidemic on immediately adjacent land and the imminent risk it will spread, poses a significant threat to an ecosystem component, or forest or rangeland resource, on the Federal land or adjacent non-Federal land; and

(5) Federal land not covered by paragraphs (1) through (4) that contains threatened and endangered species habitat, if--

(A) natural fire regimes on that land are identified as being important for, or wildfire is identified as a threat to, an endangered species, a threatened species, or habitat of an endangered species or threatened species in a species recovery plan prepared under section 4 of the Endangered Species Act of 1973 (16 U.S.C. 1533), or a notice published in the Federal Register determining a species to be an endangered species or a threatened species or designating critical habitat;

(B) the authorized hazardous fuel reduction project will provide enhanced protection from catastrophic wildfire for the endangered species, threatened species, or habitat of the endangered species or threatened species; and

(C) the Secretary complies with any applicable guidelines specified in any management or recovery plan described in subparagraph (A).

State Laws and Regulations

All prescribed burning will be in compliance with Wyoming Department of Environmental Quality Air Quality Divisions Standards and Regulations Chapter 10 Sections 2-4

Forest Service and Forest Plan Direction

Appropriate Management Response – The response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities and the values to be protected. Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001)

Guidance for Implementation of Federal Wildland Fire Management Policy 2009, states that AMR is removed from implementation guidance with “Response to Wildland Fire” as the policy area defining the actions for managing a wildland fire FSM & FSH, Best Management Practices documents, Chief’s letters, and guide books published by the National Office. Also include Forest Service Regional direction.

Forest Goals, Objectives and Strategies

Goal 1 – Ensure Sustainable Ecosystems

Promote ecosystem health and conservation using a collaborative approach to sustain the Nation’s forests, grasslands, and watersheds.

Subgoal 1.b: Provide ecological conditions to sustain viable populations of native and desired non-native species. (USDA Forest Service Strategic Plan 2000 Revision Objective 1.b)

Objectives

1. Over the life of the plan, move terrestrial, aquatic, and riparian area composition, structure, patterns, and processes toward conditions typical of those created by natural processes.

Strategies

a. Maintain or restore terrestrial, aquatic, and riparian communities, which have been reduced in quality and quantity. Examples of such communities include ponderosa pine, aspen, willow, sagebrush and meadows.

b. Restore or maintain fire-adapted ecosystems consistent with land uses, historic fire regimes, and other plan related goals and objectives.

c. Manage grass, forbs, and shrub communities to provide for sustainable levels of grazing and browsing use by big game and domestic livestock.

d. Maintain and manage habitat to retain connectivity typical of that created by natural processes unless detrimental to threatened, endangered, proposed or sensitive species.

e. Implement management practices such as prescribed burning, timber harvest, thinning, and livestock grazing that mimic natural disturbances to move landscapes toward desired vegetation composition and structure.

f. Manage old growth forests according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health and retaining the large trees contributing to the old growth structure.

Subgoal 1.c: When appropriate or where necessary to meet resource management objectives, increase the amount of forests and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects and diseases, and invasive species. (USDA Forest Service Strategic Plan 2000 Revision Objective 1.c)

Objectives

2. Within 15 years, implement vegetation management practices to reduce the threat of wildfire damage to communities and to reduce fuel loadings in the interface next to homes, cabins and other structures.

Strategies

a. Meet with cooperators annually and continue to strengthen interagency relationships to increase wildland fire protection capabilities to provide for firefighter and public safety.

b. Participate in the Firewise community program.

c. Implement fuel reduction and treatment activities beginning with fire regimes I, II and III, and condition classes 2 and 3.

d. Reduce activity fuels resulting from all projects/activities to acceptable levels in a cost effective manner, in consideration of wildlife and soil direction for retention of downed wood.

e. Use appropriate management response (suppression or fire use) on all wildfires according to the Forest Fire Management Plan. The Fire Management Plan map illustrates how areas are allocated to each fire management category.

Forestwide Standards and Guidelines

This direction applies forestwide unless more stringent or restrictive direction is found in the plan's management area prescriptions (Chapter 2) or geographic areas (Chapter 3). Additional direction is found in Appendix B, which references national and regional policies. The source of the standard or guideline is identified in [brackets] for each standard and guideline.

Standards are actions that must be followed or are required limits to activities in order to achieve forest goals. Deviations from standards must be analyzed and documented in a forest plan amendment.

Guidelines are advisable courses of action that should be followed to achieve forest goals. Deviations from guidelines must be analyzed during project level analysis and documented in a project decision document but do not require a forest plan amendment.

Physical

Air

Standards 1. Conduct all land management activities to comply with all applicable federal, state, and local air quality standards and regulations including: [R2 Desk Guide]

a. The Clean Air Act (federal), as amended, 1990. P.L. 95-95

b. Wyoming Air Quality Standards and Regulations (WAQSR)

Disturbance Processes

Fire

Standard 1. Use Appropriate Management Response[1] on all wildfires according to Management Area and Geographic Area direction. [R2 Regional Office; Medicine Bow NF]

Guidelines 1. When feasible and appropriate, use broadcast burning to dispose of slash in order to return the inorganic and organic chemicals in the foliage and small woody material to the soil, to reduce fire hazard, and to provide seed beds for natural regeneration. [R2 Desk Guide]

[1] Appropriate Management Response – The response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities and the values to be protected. Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001)

2. Where feasible and appropriate, use prescribed fire throughout the landscape, including in wilderness areas, special interest areas, research natural areas, and inventoried roadless areas to accomplish resource management goals and objectives. [Medicine Bow NF]
3. When determining the appropriate fire management response, consider the following factors: a) proximity to other ownerships including all wildland-urban interfaces, b) values at risk such as suitable timber, structural improvements, and special interest areas, c) steep topography and motorized access to the area, d) protection of watersheds especially those that provide drinking water for local communities, e) concerns related to wildlife habitat management, and f) other multiple use, ecosystem management, or agency policy objectives. [Medicine Bow NF]

Fuel Treatment

Guidelines

1. Reduce the threat of wildfire to public and private developments by following guidelines in the National Fire Protection Association Publication 299, Protection of Life and Property from Wildfire, and reduce the fuel load to acceptable levels. [R2 Desk Guide]
2. Manage for fire conditions and firefighting strategies in Wild Land Urban Interface areas with a high level of coordination with cooperating agencies and governments. Place high priority on fuel reduction and treatment activities in fire regimes I, II and III, and condition class 2 and 3 (shrub lands, lower elevation mixed conifer, lodgepole pine and aspen). Additional high priorities include municipal watersheds. [Medicine Bow NF]

Management Area Prescriptions

General

The 1985 Land and Resource Management Plan (LRMP) for the Medicine Bow National Forest included specific direction on how to manage different land areas. These land areas were called management areas and are once again used in this Revised Plan. Each management area has a certain emphasis that will direct management activities on that piece of land. Generally all management area prescriptions allow the use of prescribed fire as a land management tool except in 5.15 where the LRMP states, “Prohibit vegetation treatment in inventoried and mapped spruce-fir or lodgepole pine old growth stands.”

Table 2: Management Area Standards and Guidelines		
Management Area	Standards	Guideline
1.33 Backcountry recreation, Summer Non-motorized with Winter Snowmobiling	none	When possible, where fire suppression is necessary, use techniques, which minimize soil and vegetation disturbance. Use perimeter control or prescription control as the wildland fire management strategy.
2.1 Special Interest Areas (SIAs)	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy. Focus wildland fire management activities on protecting the values for which the SIA was identified. Use MIST (Minimum Impact Suppression Tactics) where practical. Design fuel reduction projects to maintain or protect the values for which the SIA was identified.
3.54 Special Wildlife Area, Sheep Mountain	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy. Focus wildland fire management activities on protecting the values for which this refuge was designated.

3.58 Crucial Deer and Elk Winter Range	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy.
4.2 Scenery	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy.
4.3 Dispersed Recreation	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy.
5.15 Forest Products, Ecological Maintenance and Restoration	none	Use direct control, perimeter control, or prescription control as the wildland fire management strategy.
7.1 Wildland-Residential Interface	To allow direct attack, treat management activity fuels to reduce fire intensity levels within 3 years after vegetation management activities are completed.	Cooperate with state and local governments and fire protection districts in developing fire hazard reduction plans and ordinances. Use direct control as the wildland fire management strategy.
8.21 Developed Recreation	none	Use direct control as the wildland fire management strategy.

ANALYSIS METHODOLOGY

The land and resource management plan standard for the Residential/Forest Interface (direct control response) areas that is to allow direct attack, treat management activity fuels to reduce fire intensity levels within 3 years after vegetation management activities are completed. An assumption was made

that a 4 foot flame length is the maximum acceptable allowable flame length in these areas. The rationale for this will be discussed later in the fire behavior section (Table 5).

LANDFIRE fuel model data was used for project analysis, this data set is at a landscape scale and is useful in assessment, analysis, and management. LANDFIRE fuel data describe the composition and characteristics of surface and canopy fuel. These layers serve two purposes. The first to provide consistent fuel data to support fire planning, analysis, and budgeting to evaluate fire management alternatives over large land masses. Second, is to supplement strategic and tactical planning for fire operations. 2014 LANDFIRE fuel model data was extracted from the national database at the 30M pixel resolution. Within the 30M pixel it is assumed that the entire 30M is the same fuel model. LANDFIRE data is generally updated every 3-5 years. To map this suite of wildland fuel data three categories of spatial data and the LANDFIRE Reference Database including (1) satellite imagery, (2) biophysical gradients and (3) vegetation structure and composition (http://www.publish.csiro.au/wf/Fulltext/WF08086).

Fire behavior modeling is used to predict; flame lengths, rate of spread, fireline intensity, spotting distance etc under specific environmental conditions. Inputs that go into the fire behavior models are; weather, fuel model and topographic inputs. Of the inputs required, fuel models are the most subjective. This is due to the many variables within a fuel model (i.e. compaction ratios, fuel loading per fuel particle size, whether the model is dynamic or static, ratio of woody plants to herbaceous and the moisture content of these plants, etc.) so seldom does a naturally occurring fuel model fall within the parameters of a predefined fuel model. Therefore other variable outside the established fuel model parameters are often manipulated so the fire behavior model outputs fall within what the modeling professional would expect in real life.

A description of the fuel models used are as follows:
Fuel model TL3 – FM TL3 (Timber Litter 3) is the dominant feature within the AA and is within the timber group. It is best associated with the majority the dry Lodgepole pine of the area. It is best described, though variations will exist, as closed canopy stands of short needle conifer. FM TL3 is the best representative of healthy Lodgepole pine immediately prior to beetle infestation and post infestation after the needles have fallen and before a brush or small tree component is established in the understory. It is assumed that after infestation and subsequent mortality that this fuel model will change to a slash blowdown model or if there is enough regeneration from small trees and brush it will become a timber understory model. Both of which will be described later in this document.

Fire behavior associated within the Lodgepole is generally considered to be low intensity surface fire moving through the needle cast and associated compact litter layer. Heavier fuel concentrations or “Jackpots” may encourage flare ups. Within the AA these fires may likely be viewed as mixed severity and this term may likely paint a picture of the fire activity. The Fuel model TL3 can support crown fire but usually only under ideal conditions of high temperatures, low humidity’s and high wind.

This could be a desirable fuel model post treatment do to the lack of fire behavior exhibited by this model, especially in wildland urban interface areas, however slash removal by whole tree skidding logging operations, broadcast burning post treatment or some additional slash removal method would be required to achieve this.

Fuel model TU5 – FM TU5 (Timber Understory 5) can best be described as forest types that have down material present. The primary carrier of fire in TU5 is heavy forest litter with a shrub or small tree understory usually lodgepole pine or true fir species. Spread rate is moderate; flame length high.

Within the AA TU5 represents the likely dominant fuel model after 5-15 years after the beetle epidemic. Over mature stands of Lodgepole are also present, with regeneration in the understory, though far from the dominant component of FM TU5. Mature and decadent aspen stands with a significant amount of conifer encroachment and high surface fuel loading would also fit this fuel model due to the amount of ladder and surface fuels.

Fire behavior can be intense when spreading on the surface and will likely transition to the canopy producing passive crown fire (single tree or clumps of trees torching) if an overstory is present. Significant fire control problems can be associated with this complex do to the heavy fuel loading of surface fuels and the dense shrub or small tree understory. This fuel type has occurred in several past fires such as Beaver Creek, Snake, Keystone and Lake Owen.

Fuel model SB2 – FM SB2 (Slash Blowdown 2) this is projected to be the fuel model approximately 5-15 years post the Mountain Pine Beetle (MPB) epidemic. It is comprised of moderate dead and down activity fuel or light blowdown. Fine fuel load is 7 to 12 t/ac, evenly distributed across 0-0.25, 0.25-1, and 1-3 inch diameter classes, depth is about 1 foot. Blowdown is scattered, with many trees still standing. Spread rate is moderate and flame length is moderate which will inhibit fire suppression efforts.

Fuel model SB1 – FM SB1 (Slash Blowdown 1) the will be the dominate fuel model used for Final Proposed Action (post treatment) of the timbered stands. The primary carrier of fire in SB1 is light dead and down activity fuel. Fine fuel loading in this model is 10 to 20 t/ac, weighted toward fuels 1-3 in diameter class, depth is less than 1 foot. Spread rate is moderate and flame lengths are low which increases the probability of fire control. The fine fuel loading will probably be less than what the fuel loading is in this fuel model. This fuel model though the most representative of all the fuel models is expected to over predict flame lengths if whole tree logging is used.

Fuel Model TU1- FM TU1 (Timber Understory 1) Low load dry climate timber-grass-shrub. This fuel model would best be represented by Aspen stands with little or no dead and down surface fuels or conifer encroachment. The primary carrier of fire in TU1 is low load of grass and/or shrub with litter. Fine fuel loading is as much as 1.3 t/ac. Spread rate is low; flame length low. TU1 contains live herbaceous fuel load which is dynamic, meaning that their live herbaceous fuel load is allocated between live and dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. This fuel model would be desired post treatment due to the lack of fire behavior exhibited by the model and what has been observed in past fires in this fuel type.

Fuel Model GR1 - The primary carrier of fire in GR1 is sparse grass, though small amounts of fine dead fuel may be present. The grass in GR1 is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture of extinction of GR1 is indicative of a dry climate fuelbed, but GR1 may

also be applied in high-extinction moisture fuelbeds because in both cases predicted spread rate and flame length are low compared to other GR models.

Fuel Model GR2 - The primary carrier of fire in GR2 is grass, though small amounts of fine dead fuel may be present. Load is greater than GR1, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior.

Fuel Model GR 1 & 2 –These two models represent the parks and meadow complexes within the AA and have been grouped together and tend to be similar. They are typically associated with grass and sagebrush, but can also be associated with some of the aspen component within the AA. Typically, the vegetation within these fuel models.

Fire behavior within this group can be depicted as surface fires that move rapidly through cured grass and associated material, possibly with an open shrub overstory of sage brush. Some common terminology may depict fires burning in this group as “range fires”.

Most management actions associated with this fuel model would be prescribed burning for winter range or grazing improvement.

Fuel Model GS1 - The primary carrier of fire in GS1 is grass and shrubs combined. Shrubs are about 1 foot high, grass load is low. Spread rate is moderate; flame length low. Moisture of extinction is low.

Fuel Model GS2 – The primary carrier of fire in GS2 is grass and shrubs combined. Shrubs are 1 to 3 feet high, grass load is moderate. Spread rate is high; flame length moderate. Moisture of extinction is low.

Fuel model GS 1 & 2 is within the grass shrubland fuel model groups. These have been used to represent the grass/shrub components such as sagebrush with a grass understory which one would expect to find on lower elevation drier slopes to higher elevation parks. Most management actions associated with this fuel model would be prescribed burning for winter range or grazing improvement.

Fire behavior within the complex is likely to be tempered by the greenness or “lushness’’ of the stand. Availability for burning would likely be restricted to either the spring prior to green up or late fall after curing and before the onset of winter. Fire behavior may be moderate to high if vegetation is cured and available to burn.

Fire Weather

The collection of weather data is critical for the purpose of describing many aspects of fire and fuels management within the AA. Weather data is most useful for describing the potential fire behavior across the AA. Weather conditions are a major component when potential fire behavior is analyzed.

The AA encompasses the Snowy and Sierra Madre Ranges. It receives most of its precipitation during the winter months in the form of snow. The climate of the AA can be summarized as by cool, short summers and long, snowy winters. The summer can be dry until mid-July and when associated southwest moisture becomes predominate weather pattern, commonly referred to as monsoons. Often monsoons are characterized by high based thunderstorms that can produce lightning with little

precipitation. September and October can be expected to be associated with long dry periods. The winter in the AA can be characterized by heavy snow accumulations.

Historical weather data was collected from the Sawmill Park (482105) Remote Automated Weather Station (RAWS), weather records from 2000 to 2017 where used for this analysis. The Sawmill Park RAWS is utilized because it is the representing weather station for the AA and the Snowy Range. Sandstone RAWS was installed in 2014 and does reside in the AA however it was not used for this analysis do to the lack of data available. The weather records from the RAWS will provide a source of weather data for the processing of fire behavior outputs. The Sawmill RAWS station is located at a similar altitude and within the same vegetation types as what is found in the AA. Weather data was downloaded from the Fire and Aviation Management System database and processed with FireFamily Plus (USDA Forest Service, version 4.2, 2016) using an annual filter of May 1 through October 31, which best represents a typical fire season in the AA area. The corresponding National Fire Danger Rating System (NFRDS) models is used for weather processing for the Fire Behavior Prediction System (FBPS) fuel models important to the analysis of this project. FireFamily Plus was the then run for the 90th percentile day weather observations.

Energy Release Component (ERC) is the variable that was selected for the 90th percentile weather report for the timber and shrub fuel models. The 90th percentile weather was used because that is generally the threshold that fire managers are allowed to ask for fire severity, extra resources or funds, for fire staffing. ERC is similar to Heat per Unit Area in FBPS and can be related to fire behavior outputs. The ERC tracks the seasonal trends of fire danger better than other NFDRS indices for the fuel models selected, as it is least responsive to short term fluctuations in fire danger (Deeming et al 1978).

Twenty foot wind speed is defined as sustained winds averaged over a 10 minute period and measured 20 feet above the average height of nearby vegetation. This is the standard reported by the Remote Automated Weather Stations (RAWS) owned by land management agencies and used in the National Fire Danger Rating System (NFDRS) (NOAA). BEHAVEPlus 5.05 was used to adjust the 20 foot wind speeds to produce mid-flame wind speed using appropriate reduction factors (Andrew 1986) for partially sheltered (0.4) and sheltered (0.3) fuels.

Table 3 lists 90th percentile weather output for the 2 NFDRS fuel models and corresponding Fire Behavior Fuel models (FBFM). These weather attributes will be utilized to predict potential fire behavior using BEHAVE Plus Fire Modeling System.

Table 3: Fire Weather								
Station: 482105 Vegetation Analysis Sawmill Park			Medicine Bow National Forest Landscape 90th Percentile Weather					
Variable: ERC Data: 2000-2017 Date Range: May 1 – October 30 Wind Direction: All								
Fuel model NFDRS model	GR 1 L	GR 2 L	GS 1&2 T	TL3 G	TU5 Q	TU1 R	SB2* I	SB1** J
Variable	ERC	ERC	ERC	ERC	ERC	ERC	ERC	ERC
1 Hour	4.13	4.13	3.84	4.20	3.6	3.72	3.46	3.55
10 Hour	N/A	N/A	5.55	5.43	5.06	5.26	4.85	4.92
100 Hour	N/A	N/A	N/A	10.35	10.90	11.40	10.42	10.41
Live Herbaceous	12.04***	12.04***	12.39***	N/A	N/A	13.92***	48.03	44.85
Live Woody	N/A	N/A	72.28	82.5	77.26	73.07	87.79	86.27
20 FT Wind Speed (mph)	11.12	11.12	11.52	9.96	11.25	11.51	10.16	10.28
Wind Reduction Factor	0.3 = 3.336 mph	0.4 = 4.448 mph	0.4 = 4.608 mph	0.3 = 2.988 mph	0.4 = 4.5 mph	0.3 = 3.453 mph	0.4 = 4.064 mph	0.4 = 4.112 mph

* FM SB2 is used to model No Action plus 5-10 years.

** FM SB1 is used to model the proposed action immediately after implementation assuming there is minimal treatment of the residual slash and the harvest is not whole tree skidding.

*** A fuel moisture of 30% was used in the BEHAVE calculations since anything below 30% is assumed to be fully cured.

Fire Behavior

The existing condition of fire behavior within the AA is critical for the understanding of how fire exists on the landscape and what fire behavior can be expected and potential suppression options that may be available. Fire behavior and fire hazards identify the availability of fuels to sustain a fire and relates directly to the functions of fuel, weather and topography. The expected fire intensities (measured in flame lengths) can be compared to the likely control measures and suppression tactics and the probable success or failure can be determined.

It is important to note that current conditions will be greatly altered as the ongoing MPB epidemic continues. The effects of mortality to fire behavior predictions can be extreme and will be fully disclosed throughout the remainder of the Existing Conditions and Environmental Consequences section of this analysis. Fire behavior representation will be modeled and analyzed using Behave Plus Fire Modeling System (BEHAVE plus5) for representation of surface fire attributes. Fuel models were determined using the LANDFIRE database and confirmed by actual on the ground observations. Fuel models where changed to what the expected post-treatment outcome will be in the treated areas only. The model suggests and observations have reaffirmed that; rate of spread, active crown fire potential and flame length have been substantially reduced following the fuels reduction treatments.

Surface fire behavior was modeled in the AA using BEHAVE plus5 and is listed in Table 4. The following considerations relative to the BEHAVE modeling outputs:

- Modeling runs were completed using local Remote Automated Weather Station (RAWS) data located within AA boundary. 90th percentile weather attributes where generated by FireFamily Plus (Table 4) for each fuel model. The fuel model describes fire behavior at the flaming front.
- Fuel, moisture, wind and slope are assumed to be constant during the time that the predictions are to be applied (Andrew, 1986).
- Average slope of 10% was used with upslope winds, Ridge to Valley Elevation Difference = 1000ft, Ridge to Valley Horizontal distance = 0.25 mile and Spotting Source Location = Ridge Top
- Spotting criteria for grass and shrub fuel type were as follows: downwind canopy height=75ft, Torching Tree Height = 20ft, Spot Tree Species = Lodgepole Pine, DBH = 4”, Number of Torching Trees = 4
- Spotting criteria for timbered fuel models were same as above in addition to: Canopy Base Height = 16ft, Canopy Bulk Density = .0058 lb/ft3 and Foliar Moisture = 100%.
- The fuel model describes fire spreading through surface fuels. Surface to crown fire transition and canopy fire behavior is important within the timber fuel models TL3 and TU5.
- Midflame windspeed was calculated using BEHAVEPlus 5.0.5 wind adjustment factor with the appropriate reduction factor based on the sheltering of the fuel model of question.

Table 4: Fire Behavior for No Action (Current Conditions) and Desired Conditions									
FBFM Surface Fire Behavior Analysis 90th Percentile Weather									
Alternatives	No Action	No Action	No Action	No Action	No Action	No Action	No Action Plus 5-10 years	Desired Condition	Desired Condition
Fuel model	GR1	GR2	GS1	GS2	TL3	TU5	SB2	TU1	SB1
Rate of Spread (ch/h)	14.5	49.5	21.2	29.3	1.2	10.4	15.2	2.6	6.2
Flame Length (ft)	1.8	5.3	4.1	6.0	0.9	8.2	6.4	1.8	3.2
Spotting Distance (mi.)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Transition to Crown (Crown Fire)	-	-	-	-	No	Yes	No	No	No

The Fire Behavior Prediction table above shows rates of spread, spotting distance, crown fire potential and flame lengths in weather and fuel conditions that are most conducive to fire growth. They are representations of expected fire behavior. It is important to understand potential fire behavior and what behavior to expect given a fire start. It is important to note that the desired condition and a **healthy** TL3 has the lowest rates of spread and some of the lowest flame lengths therefore increasing the effectiveness of hand crews to suppress a wildland fire and the TU5 and the no action plus 5-10 years will be the most difficult to suppress not only from a fire behavior stand point but also from a safety stand point due to the multiple snags within the stands. Generally no action plus 5-10 years has lower production rates because of the high large diameter fuels present.

For the timbered fuel models, TL3 and TU5 the depicted fire behavior is representative of surface fire behavior in those timbered stands. However, it does not represent transition and establishment in the upper canopy fuels as can be the case in most conifer stands.

When stand conditions are such that active beetle mortality is ongoing (i.e. foliage is transitioning from green to red to brown) there is a marked increase in fire intensity potential for all stands.

Mountain Pine Beetle (MPB) mortality can alter fuels and fire behavior in Lodgepole pine forests. Crown fire hazard in MPB affected stands can best be described as bi-modal. Crown Fire hazard is higher than in MPB affected stands during the 1-3 years post-epidemic while most of the dead needles are retained on the killed trees and again following snag fall and stand re-initiation when surface fuel loadings are extremely high along with increased ladder fuels from the expected; grasses, brush and small trees re-establishing the stands. During the interim period surface fire spread and intensity will be higher than in non MPB affected stands due to increased surface fuel loads.

As the epidemic wanes, the transition from standing dead to falling dead conditions is easily recognizable as that standing fuel loading starts to add significant volume to the surface fuel load. A marked increase in the surface fuel accretion, approximately 5 years post infestation, can be noticed and is the result of normal decay and stand deterioration. As the process continues fuel model distribution continues to transition from TL3 to TU5 and with some areas transitioning to fuel model SB2.

Fuel model SB2 – FM SB2 (Slash Blowdown 2) is categorized with the timber slash group. Though this fuel model is not currently abundant within the AA, there is potential for some stands, if left to their own devices to transition towards this fuel model characterized by moderate dead and down activity fuel or light blowdown. The fire then becomes difficult to control until a man-made fuel break (i.e. road, power line right-of-way, etc.) or change in fuel conditions is encountered.

To quantify the fire hazard in simple terms as it correlates to the timber stands, which are of significance to this assessment and project as a whole, FM TL3 (a healthy Lodgepole pine stand) exhibits very acceptable fire behavior, FM TU5 and SB2 (stands affected by beetle kill or other disease) has dramatically increased fire behavior.

Quantifying and providing professional analysis of fire behavior provides a basic understanding of how fire will act on the landscape. By reviewing the above fire behavior analysis, comparing fuel model associations, we can begin to understand the potential for fire across a given landscape and in this instance the Medicine Bow National Forest Landscape Vegetation Analysis Area. To further quantify what this means it is appropriate to compare the fire behavior predictions with possible suppression options. Table 6 displays fire behavior elements with fire suppression methods. As an example, compare the flame lengths in Table 5 with the available suppression method in Table 6 a person is able to see under what conditions suppression will likely be successful and under what condition specific tactics or resources will not.

Table 5: Suppression Methods		
Fire Suppression Interpretations		(NWCG Fireline Handbook, 1998)
Flame length FT	Fireline Intensity (Btu/ft/sec)	Explanation
<4	<100	Persons using hand tools can generally attack a fire at the head or flanks. Handline should hold fire.
4-8	100-500	Fires are too intense for direct attack on the head by persons using hand tools. Handline cannot be relied upon to hold fire. Equipment such as dozers or engines and retardant aircraft can be effective.
8-11	500-1000	Fires may present serious control problems – torching out, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
>11	>1000	Crowning, spotting and major fire runs are probable. Control efforts at head of fire are ineffective.

Whether a fire has the ability to transition into the canopy of a timbered stand is critical in assessing the effectiveness of suppression efforts. If fire spread is limited to the surface with flame lengths less than four feet, suppression efforts by hand crews are usually effective. If flame lengths are less than eight feet, suppression efforts are possible with the use mechanical equipment such as dozers, masticators or engines. When flame lengths exceed eight feet, as is the case in some shrublands or when crowning occurs in timbered stands, suppression efforts are limited to the flanks of the fire, as crews, mechanical equipment and aerial retardant is not effective at the head of the fire. This latter fire behavior becomes even more erratic as one considers the increase in spotting (fire brands be lifted in the air from convection by a torching tree and starting a new fire downwind), which is especially noticeable as the conifer mid-story or overstory (if present) becomes involved.

The transition of surface fire into the crown/canopy can be characterized as passive, active or independent crown fire. The fire may transition rapidly from passive to active to independent, or may remain in the passive or active stages without ever reaching the independent stage. The different stages of crown fire are described below:

> Passive – characterized by single or group tree “torching”. This stage of a crown fire is small in scale (involving one or several trees) and can reinforce or accelerate surface spread, but the main fire spread is dependent upon the surface spread rate.

Active – characterized by a "pulsing" fire that advances as a wall of flame extending from the surface fuels to well above the involved crown fuel layer. Fire carries in the crown and spread rate is greater than spread rate on the ground. However, these "runs" are relatively short lived and are dependent upon surface fire to support fire in the crown. When the surface fire catches up to where the pulse weakened, the process reinitiates.

Independent – characterized by fire "running" through the crown without the support of surface fire intensities. These runs can greatly influence fire spread over short periods of time, but are often short lived.

Much of the AA has been identified as currently being in fuel models TL3 and TU5. Within these two fuel models variation exists, from site to site, within the vertical timber stratum. Specifically, some stands contain a ladder fuel component in the form of small trees (mid or understory) and/or mature trees with a "low" Crown Base Height (CBH). At the other end of the spectrum, stands exist with little to no ladder fuels and are found to be in a closed canopy condition.

The Flame Length (FL) calculated from the surface fuel model is compared to the Critical Flame Length from the Crown Fire Initiation calculations to determine if the fire is able to produce an ignition of the canopy fuels. Critical Flame Length is the intensity required to ignite one or more trees in the canopy.

Fire Risk

Fire risk is generally defined as the probability of fire occurrence. It is important to analyze fire risk within the AA. Historical fire records can be used to determine probable risk of fire occurrence. Fire risk is a measure of fire starts on a 1,000 acre basis over a ten year period (per decade). The fire risk value corresponds to a likelihood of fire starts, per 1,000 acres, per decade. The following are risk ratings and a range of values is used to categorize risk.

- Low Risk: 0 to 0.49 – projects a fire every 20 or more years/thousand acres.
- Moderate Risk: 0.5 to 0.99 – projects one fire every 11 to 20 years/thousand acres.
- High Risk: $\geq$ 1.0 – projects at least one fire every 0 to 10 years/thousand acres/

The National Interagency Fire Management Integrated Database (NIFMID) located in Kansas City contains fire records from 2000 to 2017 that have had suppression action taken on them and had an Individual Fire Report (FS-5100-29) completed and submitted. Records indicate that there have been a total of 291 fires in the AA over an 18-year time period covered by the fire database .252 fires over the 18-year analysis period. This equates to a risk rating of Low.

It should be mentioned that the long return interval fire regimes that exist within the AA have experienced numerous low severity, low intensity fire occurrences in calculating a high risk rating. However, the occurrence that will be significant will be large scale, high intensity and stand replacement fires that are typical of this fire regime. The likelihood of fire occurrence and thus stand replacement type events will increase as succession; late seral stages and insect/disease evolve.

ENVIRONMENTAL CONSEQUENCES

Project Design Features

This section will address the environmental consequences of the proposed action and no action alternative. The evaluation will focus on the timbered stands, primarily, the Lodgepole pine and Aspen forests that have high concentrations of disease, mortality and conifer encroachment, as this complex will see the greatest impacts for the proposed action. Other effects will also be analyzed such as temporary road construction and prescribed fire. Key indicators of the effects on the fire and fuels resource would be indicators of reductions or increases in fuel profiles and fire behavior. No action conditions and post treatment conditions will be compared to derive a positive or negative effect to the fire condition. Evaluations and conclusions are based on modeling, data interpretation, literature reviews, and professional judgment as outlined throughout this analysis.

Alternative 1 - No Action

Direct Effects – No Action

Under the "no action" alternative the fuels and resulting fire behavior potential will continue to be heavily influenced by large amounts of falling dead timber as well as regeneration of young trees amongst the dead and down material.

It should be noted that the majority of the proposed timber management units are not in close proximity to typical values at risk, such as structures or other improvements, thus, the threat of a severe wildfire event impacting values at risk in the form of residences, cabins, and agricultural structures is going to be little changed as a result of either alternative. However, the high severity fire activity that could be expected in these areas in the future may have negative impacts on other resources due to increased total heat output as well as increased residence time of the flaming front as a result of the heavy dead and down fuel loading.

As the dead trees continue to fall there will also be a reduction in sheltering from the canopy. Where canopy cover is decreased, increases in wind speed at the ground level are expected (Whitehead et al. 2006). An increase in total solar input can also be expected and will affect fuel temperature and moisture content (Whitehead et al. 2006).

Of these effects it is the heavy load of dead and down material that will most differ between the two proposed alternatives. Whether the trees are cut and removed or allowed to fall, the regeneration of young trees will occur as will the reduction in shelter from the canopy. The direct effects of the "no action" alternative as they result to fire and fuels management will thus be characterized by the results of the transition toward a heavy fuel load of large diameter ground fuels.

If the "no action" alternative occurs, the stands in the PA will transition from the TL3 fuel model previously described and will transition to more closely resemble other fuel models. Of the standard fuel models, TU5 (Very High Load, Dry Climate Timber-Shrub) most accurately predicts Heat per Unit Area (measured as BTU/ft^2) and SB2 (Moderate Load Activity Fuel or Low Load Blowdown) most accurately predicts rate of spread (measured as ch/hr). These fuel models will never exactly replicate the conditions present on the ground in all units, but will provide a reasonable comparison of expected future fire behavior under the "no action" and "proposed action" alternatives. Graphs 1 & 2 below show predicted differences in fire behavior between the "Current Condition" (TL3) and the "No Action Condition" (TU5 for heat per unit area) and (SB2 for rate of spread) under the previously discussed 90th percentile weather conditions using Behave Plus (version 5.0.5). Graphs 3-6 use the Basic Fire Behavior Tool in WFDSS to compare predicted fire behavior across the PA under the current condition and the expected condition in 10 years assuming the "no action" alternative is selected.

As well as requiring an increased commitment of resources, fires in stands that receive "no action" will pose an increased risk to fire personnel in the foreseeable future as the dead trees will become more likely to fall and injure personnel.

Figure 2: Current Condition (TL3 and TU5) and No Action +10 Years (SB2) Rate of Spread

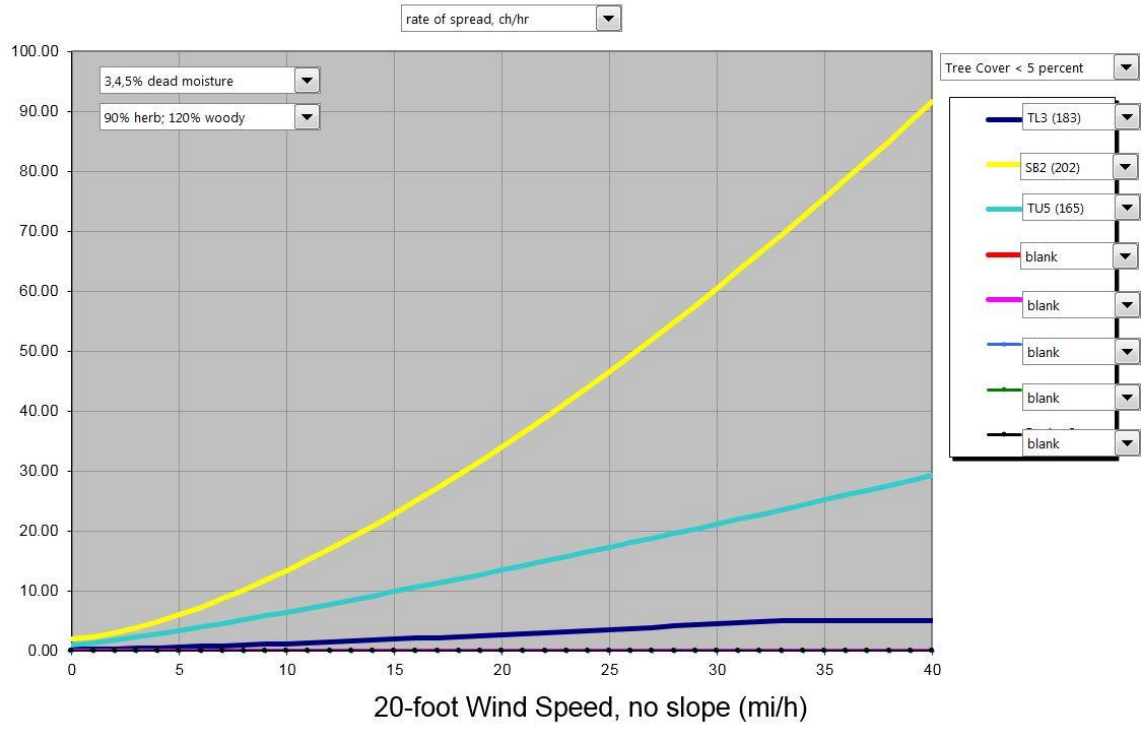
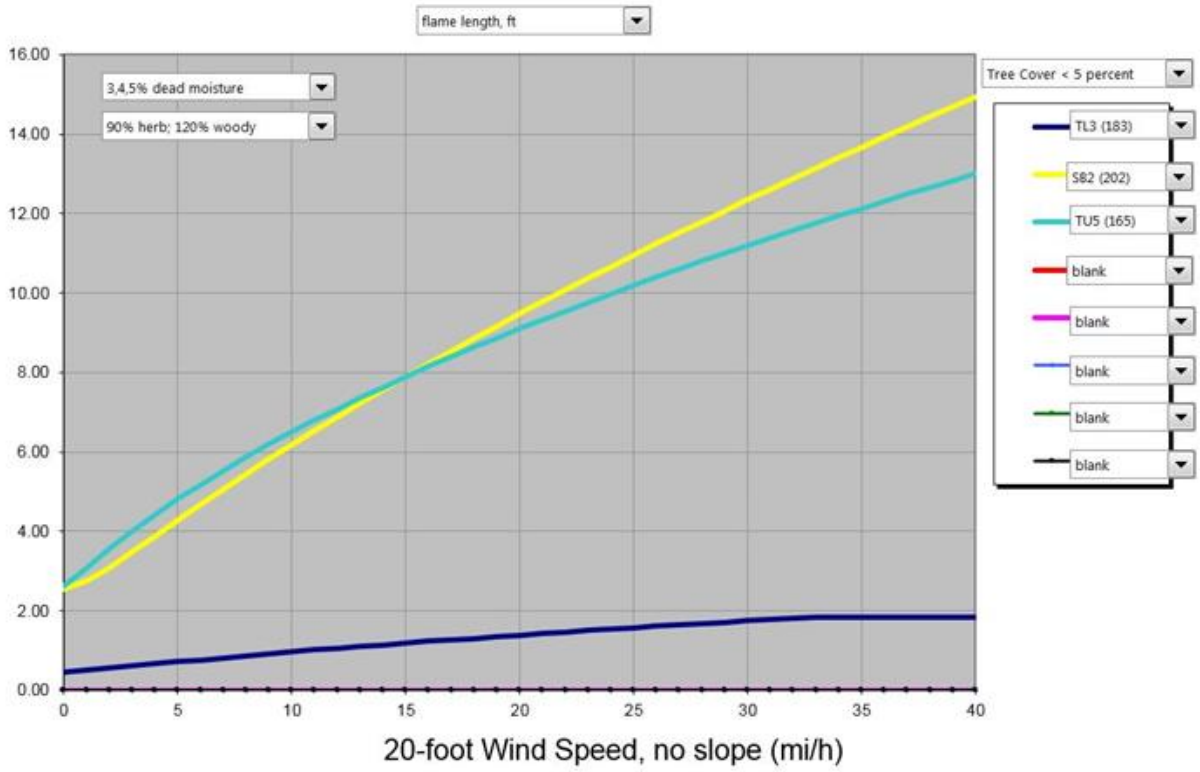


Figure 3: Current Condition (TL3 and TU5) and No Action +10 Years (SB2) Flame Length



In areas that are proposed for precommercial thinning treatment, no action would likely result in a future increase in the stand's ability to maintain crown fire spread due to the higher crown bulk density (CBD) in very thick stands of regenerating Lodgepole pine. Not treating these stands would result in lower surface fire potential as surface fuel loading would remain relatively unchanged. Furthermore, over time the canopy base height (CBH) would increase as the existing trees grow, coupled with the mostly unchanged surface and ladder fuels crown fire initiation would be less likely. However, if crown fire was initiated it would have a higher potential to sustain itself in the tighter canopy.

If no action is taken relating to travel management in the area, fire occurrence and ability of fire management resources to respond would be relatively unchanged. The number of people and the places they are able to access via motorized vehicle would not change resulting in little change in the number and location of human caused fires. If fires start, response times by fire management resources would be little changed as well.

Indirect Effects – No Action

The smoke generated from a fire that has no suppression action taken is considered an indirect effect. The smoke emissions could not be mitigated and the impacts of the smoke on the public could be considerable. The existence of roads can have an effect on wildfire size and shape. The existence of a road has little effect at the head of a fire burning under extreme conditions or in the canopy of a conifer stand. However, the existence of roads can have an effect on the spread of fires by acting as a fuel break, where the primary carrier is shrubs or grass and where the fire remains primarily on the surface.

Cumulative Effects – No Action

Although parts of the forest would benefit from past harvest activity and current projects, including hazard tree removal, thinning units, and State Forestry fuel break and defensible space projects, fire and fuel conditions in the analysis area would not move toward the Forest Plan desired condition to lessen fuel loadings and reduce fire behavior. Other projects and natural processes would not manage hazardous fuel loadings, improve ingress and egress, or provide protection to municipal water supplies from fire. However, the forest condition would remain within the natural ecological progression of this forest complex and associated fire regimes.

Alternative 2 - Proposed Action

The Forest Service proposes to conduct vegetation management activities on NFS lands, including inventoried roadless areas, within the Sierra Madre and Snowy Range Mountain Ranges of the Medicine Bow National Forest. The Notice of Intent for the LaVA EIS described that vegetation management activities, including prescribed fire, mechanical, and hand treatment methods, could be applied to 150,000 – 350,000 acres within the designated Treatment Opportunity Areas (615,230 acres, see Map 3) to protect, restore and enhance forest ecosystem components; reduce wildfire risk to communities and municipal water supplies; supply forest products to local industries; and improve, protect, and restore wildlife habitat.

- Stand initiating or even-aged treatment methods would not exceed **95,000 acres**.
- Uneven-aged or intermediate treatments would not exceed **165,000 acres**.
- Other vegetation treatments including prescribed fire, mastication, and hand thinning would not exceed **100,000 acres**.
- Cutting trees or shrubs using a variety of treatment methods including, but not limited to, clearcutting/coppice; group and individual tree selection; salvage; mastication; sanitation; and thinning.
- Cutting trees that have encroached on grass and shrub lands to maintain desired species dominance and improve wildlife habitat.
- Prescribed burning areas using jackpot, pile burning, and broadcast burning. Maintenance burns on previously treated areas would occur to maintain desired fuels or habitat conditions.
- Prescribed burning or tree/shrub cutting on portions of inventoried roadless areas (IRAs). The TOAs in IRAs were proposed by Cooperating Agencies and the Forest Service to protect

communities at risk; threatened, endangered, and sensitive wildlife habitat; critical infrastructure including fences and ditches; and municipal water supplies.

- Tree clearing and/or removal along critical linear structure including fences, ditches, and utilities;
- Utilizing and/or reconstructing existing open and closed NFS roads to access treatment units. Reconstruction may include road blading, culvert installation or replacement, and gravelling. Closed NFS roads would be for administrative access only (i.e., they will be managed as closed to the public) and would be returned to a closed status with the method of closure being determined at implementation.
- Developing checklists, standards, protocols, and monitoring requirements in the environmental impact statement to guide project implementation, including:
    - Complete all required surveys for each individual treatment area; complete required layout and marking of each treatment area; determine appropriate design features to be applied; and document compliance with requirements of the environmental impact statement using a set of pre-established field checklists.
    - Perform monitoring during and following implementation of individual treatment activities to ensure treatments are implemented as planned and that project objectives are met.
    - Establish an annual monitoring review with interested stakeholders, partners, and collaborative groups to ensure treatments are implemented as planned and that project objectives are being attained.
- Using a combination of commercial timber sales, service contracts, stewardship contracts, cooperative authorities, partner capacity, and Forest Service crews to implement the project.
- Treatments would be authorized for a 10-year period beginning in 2018 and would be completed within approximately 15 years of the project decision.

Direct Effects – Proposed Action

Past timber practices (post 1950) on the forest in MA 5.15 have had a positive influence on the current fire and fuels situation. Areas that have been regenerated or that have received partial harvest treatments are less susceptible to bark beetle attack and aggregation. These past silvicultural treatments reduced the threat of high intensity/high severity wildland fires by increasing canopy spacing (reducing the crown fire potential) and lowering the fuel loading. Many of these past treatments were not designed to reduce this threat; this has been accomplished to some degree.

Prescribed Burning (Broadcast Burning)	Although the primary objective of the broadcast burning is the reintroduction of fire into a fire adapted ecosystem and to create a mosaic of shrub, forbs, and grass age classes, there will also be benefits to the fuels profile and subsequent fire behavior by lowering the fuel loading and producing more vigorous grasses and forbs that are generally more fire retardant (less dead and decadent fuel). The smoke generated during broadcast burning is considered a direct effect. The smoke emissions can be mitigated. Burning (as required by Forest Service policy) will

	only be completed in accordance with the Wyoming Division of Environmental Quality (DEQ) policy. The direct effects of smoke can be managed by burning on days when the ventilation category is Good to Excellent. Precautions must be taken when burning near populated areas, highways, and other smoke-sensitive areas. Ventilation Category forecasts are available from the National Weather Service.
Mechanical Treatments (Salvage, Commercial Thinning, Precommercial Thinning, Mastication, etc.)	Mechanical treatments can create substantial changes to how fire behaves on the landscape. The partial removal of standing trees can inhibit crown fire behavior by increasing crown spacing. One of the primary influences on fire behavior resulting from mechanical operations is how the slash is treated. Slash treatments may be accomplished by any of the following methods: lop and scatter, machine pile and burn, mastication or chipping. As one would expect, the analysis indicates that flame lengths will be lower in the units treated by piling and burning, than under the lopping strategy, under all slash treatment scenarios. Except for precommercial thinning, the slash is left untreated, and the "no-action" alternative, passive crown fire occurs. Precommercial thinning is one method of reducing the subsequent potential crown fire behavior, the residual slash can greatly increase the surface fuel loading and subsequent risk of wildfire on harvested sites. Fire behavior following precommercial thinning treatments can vary greatly, with both depth and loading playing a significant role. Lop and scatter treatments effectively increased the surface area exposed on dead and downed fuels as well as keeping fuels on the ground. Resulting in an increase in total fuel loading and calculated flame lengths and fireline intensity.
Temporary Road Construction	Under the proposed action, up to 600 miles of new temporary roads could be constructed The number of accessible roads is a "double-edged sword" in terms of travel management and fire suppression. While roaded access (even temporary in nature) to an area increases the risk of human-caused ignition, the same roads provide access to firefighting personnel and equipment, aiding in shorter response times, providing access during extended attack and providing man-made fuel breaks to aid in fire suppression. Given the high fire risk in the area (see fire risk analysis) additional road access could contribute to a significant amount of additional ignitions. Temporary roads on the other hand probably would not add to the risk since they will be closed within 3 years of treatment completion however the benefit of a man made fuel break is expected to last much longer perhaps as long as 20 years.

Indirect Effects – Proposed Action

Broadcast and Pile Burning	The proposal includes broadcast burning as well as pile burning of conifer slash, following the fuels and harvest treatments. The smoke generated by burning is considered an indirect effect. The smoke emissions can be mitigated by burning smaller areas, burning when fuels are drier (reducing the smoldering phase), avoid burning late in the day which would give fuels time to consume during the best ventilation times etc. Burning (as required by Forest Service policy) will only be completed in accordance with the Wyoming Division of Environmental Quality (DEQ) policy. The indirect effects of smoke can be managed by burning on days when the ventilation category is Good to Excellent. Precautions must be taken when burning near populated areas, highways, and other smoke-sensitive areas. Ventilation Category forecasts are available from the National Weather Service.
Mechanical Treatments (Salvage, Commercial Thinning, Mastication, etc.)	Available slash treatments include pile or broadcast burning post treatment. The smoke generated by burning is considered an indirect effect. The smoke emissions can be mitigated by burning smaller areas, burning when fuels are drier (reducing the smoldering phase), avoid burning late in the day which would give fuels time to consume during the best ventilation times etc. Burning (as required by Forest Service policy) will only be completed in accordance with the Wyoming Division of Environmental Quality (DEQ) policy. The indirect effects of smoke can be managed by burning on days when the ventilation category is Good to Excellent. Precautions must be taken when burning near populated areas, highways, and other smoke-sensitive areas. Ventilation Category forecasts are available from the National Weather Service.
Temporary Road Construction	The existence of man-made fuel breaks such as temporary roads can have an effect on wildfire size and shape. The existence of a temporary road has little effect at the head of a fire burning under extreme conditions or crown fire. However, the existence of temporary roads, assuming they have not fully revegetated, can have a positive effect on reducing fire spread where the primary carrier is shrubs or grass and where the fire remains primarily on the surface.

Cumulative Effects – Proposed Action

The proposed silvicultural treatments complement past projects in the forest plan area and move the analysis area closer to the desired condition for fire and fuels management. Treatments would manage hazardous fuel loadings, improve ingress and egress, and provide protection to municipal water supplies, critical infrastructure and communities within the wildland urban interface from fire.

It is most desirable to limit the expansion of the higher severity fuel models TU5, SB1 and SB2 and promote and maintain the more desirable fuel models TL3 and TU1 which exhibits lower fire hazard, (Fig. 2 & 3). In all cases, both during and post beetle epidemic, the proposed action move the Analysis Area closer to the desired condition from a fire and fuels management standpoint.

COMPLIANCE WITH REGULATORY DIRECTION

No Action Alternative

The No Action alternative is not consistent with both the fire and fuels standards and guidelines under Medicine Bow Forest Land Resource Management Plan (2003). This alternative may result in deviation from these standards and guidelines from the Forest Plan 7.1 areas.

- In MA 7.1, the standard is to direct attack, treat management fuels to reduce fire intensity within 3 years after vegetation management activities are completed. The guidelines state to cooperate with state and local governments and fire protection districts in developing fire hazard reduction plans and ordinances and to use direct control as the wildland fire management strategy.

The No Action Alternative would result in the loss of the direct attack control option. With no planned fuel treatments the fuel loadings will increase in each individual stand, the potential for escape from initial attack resources and for larger than normal wildland fires will also increase. The high fine fuels will increase the rate of spread until the fine fuels are reduced by decomposition and compaction over time. The number of dead trees and potential large down fuel component in the future will limit fire fighter access, increase time needed to control a fire, limit defensible space and expose firefighters to hazardous dead trees.

Proposed Action Alternative

Based on Forest Plan Direction, the Healthy Forest Restoration Act, and a comparison of the existing condition and the desired future condition, the proposed action is to:

Reduce the amount and continuity and change the arrangement of existing fuels surrounding WUI areas, special-use permit areas, and municipal water supplies within the analysis area. Thousands of acres of dead and dying trees associated with the beetle epidemic are anticipated to result in increased fuel densities, fuel continuity, and fuel loads both inside and outside of the analysis area boundary. These factors increase the risk of wildfires adjacent to WUI and special-use permit areas, municipal water supplies, as well as in the larger analysis area. To address these conditions, the project is <u>needed</u> to:

- Manage and maintain hazardous fuel loadings associated with the beetle epidemic to minimize the potential for catastrophic wildfires;
- Manage and maintain hazardous fuels so that wildfires may be more manageable if they occur;
- Improve and maintain egress and ingress access to provide safety for firefighters and the public in the event of a fire; and
- Manage hazardous fuel loadings to protect municipal water supplies and water quality.

This project responds to Purpose (1) of the HFRA (Section 2):

> "Reduce wildfire risk to communities, municipal water supplies, and other at-risk Federal land through a collaborative process of planning, prioritizing, and implementing hazardous fuel reduction projects."

This project also responds to the goals and objectives outlined in the Forest Plan and helps move the project area towards desired conditions described in the Plan. Forest Plan goals and objectives for this analysis include:

Goal 1: Ensure Sustainable Ecosystems

Promote ecosystem health and conservation using a collaborative approach to sustain the Nation's forests, grasslands, and watersheds.

Subgoal 1.b: Provide ecological conditions to sustain viable populations of native and desired non-native species. (USDA Forest Service Strategic Plan 2000 Revision Objective 1.b)

Subgoal 1.c: When appropriate or where necessary to meet resource management objectives, increase the amount of forests and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects and diseases, and invasive species. (USDA Forest Service Strategic Plan 2000 Revision Objective 1.c)

Objectives

1. Over the life of the plan, move terrestrial, aquatic, and riparian area composition, structure, patterns, and processes toward conditions typical of those created by natural processes.

2: Within 15 years, implement vegetation management practices to reduce the threat of wildfire damage to communities and to reduce fuel loadings in the interfaced next to homes, cabins, and other structures. ***(Forest Plan page 1-5)***

Table 6: Forest Wide Standards and Guidelines for Fire & Fuels

Forest Standard and Guideline	Forest Plan Direction	Proposed Action Consistency	No Action Alternative Consistency
Fire	Use Appropriate Management Response on all wildfires according to Management Area and Geographic Area direction. [R2 Regional Office; Medicine Bow NF]	Consistent: Proposed Action allows for "Response to Wildfires".	Consistent: No Action allows for "Response to Wildfires".
	When feasible and appropriate, use broadcast burning to dispose of slash in order to return the inorganic and organic chemicals in the foliage and small woody material to the soil, to reduce fire hazard, and to provide seed beds for natural regeneration.	Consistent: Prescribed fire and pile burning will be used to achieve the goals of the project where applied.	Inconsistent: No Action does not allow for the removal of any material or the use of prescribed burning of any kind.

	Where feasible and appropriate, use prescribed fire throughout the landscape, including in wilderness areas, special interest areas, research natural areas, and inventoried roadless areas to accomplish resource management goals and objectives.	Inconsistent: Prescribed fire will be used to achieve the goals of the project where applied except in Wilderness Areas where HFRA does not allow treatment of in these areas.	Inconsistent: No Action does not allow use of prescribed burning of any kind.
	When determining the appropriate fire management response, consider the following factors: a) proximity to other ownerships including all wildland-urban interfaces, b) values at risk such as suitable timber, structural improvements, and special interest areas, c) steep topography and motorized access to the area, d) protection of watersheds especially those that provide drinking C) water for local communities, e) concerns related to wildlife habitat management, and f) other multiple use, ecosystem management, or agency policy objectives.	Consistent: Final Proposed Action allows for "Response to Wildfires".	Consistent: No Action allows for "Response to Wildfires".
Fuels	Reduce the threat of wildfire to public and private developments by following guidelines in the National Fire Protection Association Publication 299, Protection of Life and Property from Wildfire, and reduce the fuel load to acceptable levels.	Consistent: Both mechanical treatments and prescribed fire will be used to achieve the goals of this project.	Inconsistent: No Action does not allow for the removal of any material or the use of prescribed burning of any kind.
	Manage for fire conditions and firefighting strategies in Wild Land Urban Interface areas with a high level of coordination with cooperating agencies and	Consistent: This project will address the fuels concerns adjacent to the private lands and	Inconsistent: No Action does not allow for the fuels reduction of any kind.

	governments. Place high priority on fuel reduction and treatment activities in fire regimes I, II and III, and condition class 2 and 3 (scrublands, lower elevation mixed conifer, lodgepole pine and aspen). Additional high priorities include municipal watersheds.	wildland urban interface.	

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APPENDIX